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TV RECEIVER WITH ANALOG & DIGITAL TUNER

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[There are no amendments to this patent.]

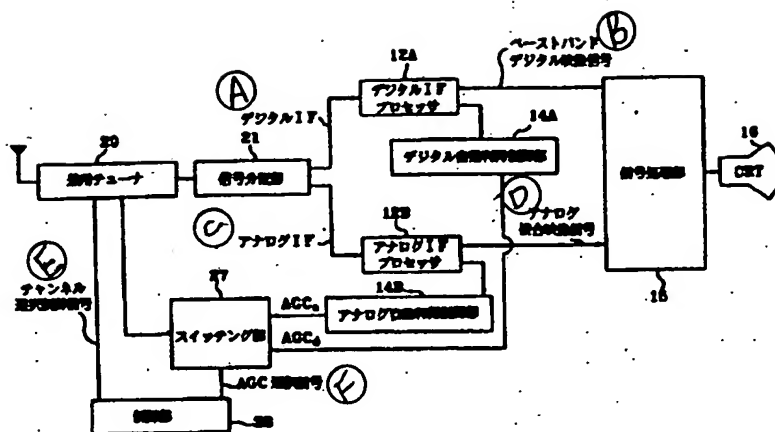
Abstract (amended)

Problem

To offer a TV receiver, which can receive both analog and digital broadcasting signals and process the signals.

Means to solve

The control unit (28) applies a broadcasting system channel selection control signal to an analog and digital tuner (29), and applies an AGC selection signal by the broadcasting system to the switching unit (27). The analog and digital tuner selects a channel in the applicable broadcasting system corresponding to the impressed channel selection control signal, adjusts the gain to the RF signal of the selected channel according to an automatic gain control signal, which is supplied, and then converts it to an IF signal. The signal distributing unit (21) classifies the IF signal from the analog and digital tuner according to the broadcasting system, and outputs it. The analog processor (12B) and the digital processor (12A) restore the analog complex image signal and the baseband digital image signal from the corresponding IF signal. The switching unit to which the automatic gain control signal that is generated according to the restored signal level has been supplied selects one of the automatic gain control signals inputted according to the applied AGC selection signal and supplies it to the analog and digital tuner.



- Key:
- A Digital IF
  - B Baseband digital image signal
  - C Analog IF
  - D Analog complex image signal
  - E Channel selection control signal
  - F AGC selection signal
  - 12A Digital IF processor
  - 12B Analog IF processor
  - 14A Digital automatic gain control unit
  - 14B Analog automatic gain control unit
  - 15 Signal processing unit
  - 20 Analog and digital tuner
  - 21 Signal distributing unit
  - 27 Switching unit
  - 28 Control unit

### Claims

1. A TV receiver that can receive both analog broadcasting signals and digital broadcasting signals and process the signals characterized in that it comprises, a device to automatically control the RF gain of an analog and digital tuner comprising

an analog and digital tuner, which selects a channel in the applicable broadcasting system corresponding to the channel selection signal applied from among the aforementioned received broadcasting signals, adjusts the gain to the RF signal of the aforementioned selected channel corresponding to the applied automatic gain control signal, and converts this to an intermediate frequency signal;

a signal distributing unit, which distributes the IF signal from the aforementioned analog and digital tuner according to the broadcasting system;

an analog processor, which restores the analog IF signal from the aforementioned signal distributing unit to an analog complex image signal by means of amplification and detection, and generates an analog automatic gain control signal to adjust the RF gain of the aforementioned analog and digital tuner from this restored signal;

a digital processor, which restores the digital IF signal from the aforementioned signal distributing unit to a baseband digital image signal by means of amplification and detection, and generates a digital automatic gain control signal to adjust the RF gain of the aforementioned analog and digital tuner from this restored signal;

a switching unit, which selects one of the automatic gain control signals from the aforementioned respective processors corresponding to the applied AGC selection signal, and supplies it to the aforementioned analog and digital tuner; and

a control unit, which, corresponding to the user's request, applies a channel selection control signal for each of the broadcasting systems to the aforementioned analog and digital tuner, and also applies an AGC selection signal for each of the broadcasting systems to the aforementioned switching unit.

2. The TV receiver with an analog and digital tuner according to Claim 1, wherein the aforementioned control unit

applies an AGC selection signal to select an analog automatic gain control signal if the channel selected by the user is in an analog broadcasting system, and applies an AGC selection signal to select a digital automatic gain control signal if it is in a digital broadcasting system.

#### Detailed explanation of the invention

[0001]

#### Technical field of the invention

The present invention pertains to a TV receiver, which can receive and process both analog broadcasting signals and digital broadcasting signals. In particular, it pertains to a TV receiver equipped with one analog and digital tuner and a device to automatically control the RF gain of this analog and digital tuner.

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[0002]

Prior art

In general, an automatic gain control (AGC) circuit automatically controls the gain of an amplifier so that the output signal level will be constant even if the input signal level varies. An AGC circuit adopted in a TV receiver automatically controls the RF gain of the RF amplifier provided on the tuner and the IF gain of the intermediate frequency amplifier connected to the output terminal of the tuner, thereby keeping the level of the restored image signal constant even if the level of the received broadcasting signal changes.

[0003]

Meanwhile, an advanced TV receiver can receive and process both analog broadcasting signals in the analog broadcasting system and digital broadcasting signals in the digital broadcasting system, and displays the received broadcasting signals, which have been restored to the original image signals, in the screen. Based on Figure 1, a conventional advanced TV receiver equipped with an analog tuner and a digital tuner, which individually control the RF gain, will be explained.

[0004]

The TV receiver in Figure 1 comprises two separate blocks: the block to receive and process digital broadcasting signals and to restore them as baseband digital image signals; and the block to receive and process analog broadcasting signals and to restore them to analog complex image signals. The digital tuner (10A) selects a channel from among the received digital broadcasting signals, which corresponds to the channel selection control signal from the control unit (18), amplifies the RF signal of the selected channel corresponding to the digital automatic gain control signal (AGCd) provided as feedback from the digital automatic gain control unit (14A), and then, converts this to a digital intermediate frequency (IF) signal. The digital IF processor (12A) amplifies and detects the digital IF signal from the digital tuner (10A), and restores this signal as a baseband digital image signal. The digital automatic gain control unit (14A) generates a digital automatic gain control signal (AGCd) to lower the amplification degree of the high frequency amplifier (not illustrated) provided on the digital tuner (10A) if the output level of the digital IF processor (12A) is larger than the preset value. If the output level of the digital IF processor (12A) is smaller than the preset value, it generates a digital automatic gain control signal (AGCd) to increase the amplification degree of the aforementioned high frequency amplifier (not illustrated) and supplies the generated digital automatic gain control signal to the digital tuner (10A).

[0005]

Meanwhile, the analog tuner (10B) selects a channel from among the received analog broadcasting signals, which corresponds to the channel selection control signal from the control unit (18), amplifies the RF signal of the selected channel corresponding to the analog automatic gain control signal (AGCa) provided as feedback from the analog automatic gain control unit (14B), and then converts this to an analog intermediate frequency (IF) signal. The analog IF processor (12B) amplifies and detects the analog IF signal from the analog tuner (10B), and restores this signal as an analog complex image signal. The analog automatic gain control unit (14B) generates an analog automatic gain control signal (AGCa) to lower the amplification degree of the high frequency amplifier (not illustrated) provided on the analog tuner (10B) if the output level of the analog IF processor (12B) is larger than the preset value. If the output level of the analog IF processor (12B) is smaller than the preset value, it generates an analog automatic gain control signal (AGCa) to increase the amplification degree of the high frequency amplifier (not illustrated) and supplies the generated analog automatic gain control signal to the analog tuner (10B).

[0006]

The signal processing unit (15) converts both the baseband digital image signal from the digital IF processor (12A) and the analog complex image signal from the analog IF processor (12B) to a luminance signal and a color-difference signal, then converts the signals to a preset display format and displays them on the CRT (16). Since this signal processing method is known to people with the appropriate technical skills and not related to the main point of the present invention, the method will not be explained in detail here.

[0007]

The control unit (18) applies a channel selection control signal to select the applicable channel using the digital tuner (10A) if the channel selected by the user is in a digital broadcasting system. If the channel selected by the user is in an analog broadcasting system, it applies a channel selection control signal to select the applicable channel using the analog tuner (10B). In this manner, either the digital tuner (10A) or the analog tuner (10B) selects the applicable channel corresponding to the channel selection control signal from the control unit (18).

[0008]

However, since the conventional TV receiver illustrated in Figure 1 comprises two separate broadcasting signal processing blocks for respective broadcasting systems, there is no

systematic relationship between the broadcasting signal processing blocks. Thus, the system configuration is complex, and therefore, the cost becomes high. Further, since the aforementioned tuners (10A) and (10B) should be individually controlled corresponding to the broadcasting system of the channel to be viewed, the TV receiver in Figure 1 has another problem in that the control method is complex and inefficient.

[0009]

Problems to be solved by the invention

The present invention was made to solve the aforementioned problems. The object is to offer a TV receiver comprising an analog and digital tuner, which can selectively receive and select either analog broadcasting signals or digital broadcasting signals and a device to automatically control the RF gain of this analog and digital tuner, and thereby having a simple and systematically configured system which can easily control the aforementioned analog and digital tuner.

[0010]

Means to solve the problems

The TV receiver to realize the aforementioned object is a TV receiver, which can receive and process both analog broadcasting signals and digital broadcasting signals, comprising an analog and digital tuner, which selects, corresponding to the applied channel selection control signal, a channel in said broadcasting system from among the aforementioned received broadcasting signals, adjusts the gain of the RF signal of the aforementioned selected channel corresponding to the impressed automatic gain control signal, and converts this to an intermediate frequency (IF) signal; a signal distributing unit to distribute the IF signal from the aforementioned analog and digital tuner according to the broadcasting system; an analog processor which generates an analog automatic gain control signal to amplify and detect the analog IF signal from the aforementioned signal distributing unit, to restore it as an analog complex image signal, and to adjust the RF gain of the aforementioned analog and digital tuner according to this restored signal; a digital processor which generates a digital automatic gain control signal to amplify and detect the digital IF signal from the aforementioned signal distributing unit, to restore it as a baseband digital image signal, and to adjust the RF gain of the aforementioned analog and digital tuner according to this restored signal; a switching unit which selects one of the automatic gain control signals from the aforementioned respective processors corresponding to the applied AGC selection signal, and supplies it to the aforementioned analog and digital tuner; and a control unit, which, corresponding to the request by the user, applies the channel selection control signal for respective broadcasting systems to the aforementioned

analog and digital tuner, and applies the AGC selection signal for respective broadcasting systems to the aforementioned switching unit.

[0011]

#### Application modes of the invention

Next, a preferable application example of the present invention will be described in detail based on the attached drawings. In reference to Figure 2, the analog and digital tuner (20) selects from among the received analog broadcasting signals and digital broadcasting signals a channel in the applicable broadcasting system corresponding to the channel selection control signal from the control unit (28). Further, the analog and digital tuner (20) adjusts the gain to the RF signal of the channel selected corresponding to the automatic gain control signal from the switching unit (27). Then, the analog and digital tuner (20) converts the RF signal with the gain adjustment done on it to an intermediate frequency (IF) signal, which is easy to amplify. The signal distributing unit (21) classifies the IF signal from the analog and digital tuner (20) according to the broadcasting system, and distributes it to the digital IF processor (12A) if it is a digital IF signal, and to the analog IF processor (12B) if it is an analog IF signal.

[0012]

Figure 2, the digital IF processor (12A), the digital automatic gain control unit (14A), the analog IF processor (12B), the analog automatic gain control unit (14B), the signal processing unit (15) and the CRT (16) perform the same functions as the corresponding items in Figure 1 and are keyed identically, so they are not explained in detail. The switching unit (27), corresponding to the AGC selection signal from the control unit (28), selects one of the digital automatic gain control signals (AGCd) from the digital automatic gain control unit (14A) and one of the analog automatic gain control signals (AGCa) from the analog automatic gain control unit (14B) and supplies them to the aforementioned analog and digital tuner (20).

[0013]

The control unit (28), corresponding to the request by the user, decides whether the channel selected by the user is in the analog broadcasting system or in a digital broadcasting system. Then, based on this decision result, the control unit (28) applies the channel selection control signal for each broadcasting system to the analog and digital tuner (20), and applies the AGC selection signal for each broadcasting system to the switching unit (27). At this time, the control unit (28) generates an AGC selection signal to select an analog automatic gain control signal (AGCa) if the channel selected by the user is a channel in the analog broadcasting system.



If the channel selected by the user is a channel in the digital broadcasting system, it generates an AGC selection signal to select a digital automatic gain control signal (AGCd).

[0014]

The operation of the device in Figure 2 having the aforementioned configuration will be explained. First, suppose the user has selected a specific channel in the analog broadcasting system. Corresponding to the request by the user, the control unit (28) applies a channel selection control signal to select a specific channel in the analog broadcasting system to the analog and digital tuner (20), and applies an AGC selection signal to select an analog automatic gain control signal (AGCa) to the switching unit (27). The analog and digital tuner (20) selects the applicable channel in the analog broadcasting system corresponding to the applied channel selection control signal, and converts the RF signal of the selected channel to an intermediate frequency signal (IF). The signal distributing unit (21) distributes the analog IF signal from this analog and digital tuner (20) by means of the analog IF processor (12B). The analog IF processor (12B) amplifies and detects the input analog IF signal and restores it as an analog complex image signal. The analog automatic gain control unit (14B) generates an AGC voltage to lower the RF gain of the aforementioned analog and digital tuner (20) if the signal level of the image signal is larger than the preset value. If it is smaller than the preset value, the unit generates an AGC voltage to increase the RF gain of the aforementioned analog and digital tuner (20).

[0015]

The switching unit (27) selects the AGC voltage from the analog automatic gain control unit (14B) corresponding to the AGC selection signal applied from the control unit (28) and supplies it to the analog and digital tuner (20). The analog and digital tuner (20) adjusts the gain to the RF signal of the selected channel by means of the AGC voltage from the switching unit (27), then converts it to an IF signal and outputs it. The device in Figure 2 repeats this process so as to keep the level of the restored analog complex image signal constant even if the level of the RF signal received by the analog and digital tuner (20) varies.

[0016]

Meanwhile, the operation of the device in Figure 2 when the user has selected a specific channel in the digital broadcasting system can be understood based on the explanation of the operation in the analog system above. Therefore, it will not be explained in detail here.

[0017]

#### Effect of the invention

As explained above, according to the present invention, since the TV receiver comprises an analog and digital tuner, a signal distributing unit, a switching unit and a control unit, the system to receive and process both analog broadcasting signals and digital broadcasting signals can be systematically and simply configured. Consequently, the cost can be effectively lowered. Further, on the TV receiver according to the present invention, the analog and digital tuner (20) and the switching unit (27) can be controlled using the channel selection control signal and the AGC selection signal associated with the broadcasting system to be viewed. Thereby, the aforementioned analog and digital tuner (20) can be easily controlled.

#### Brief description of the figures

Figure 1 is a block diagram illustrating a conventional advanced TV receiver equipped with both an analog tuner and a digital tuner, which have the RF gains individually controlled.

Figure 2 is a block diagram illustrating a TV receiver according to a preferable application example of the present invention, comprising an analog and digital tuner and a device to automatically control the RF gain of this analog and digital tuner.

#### Explanation of symbols

- 12A Digital IF processor
- 12B Analog IF processor
- 14A Digital automatic gain control unit
- 14B Analog automatic gain control unit
- 15 Signal processing unit
- 16 CRT
- 20 Analog and digital tuner
- 21 Signal distributing unit
- 27 Switching unit
- 28 Control unit

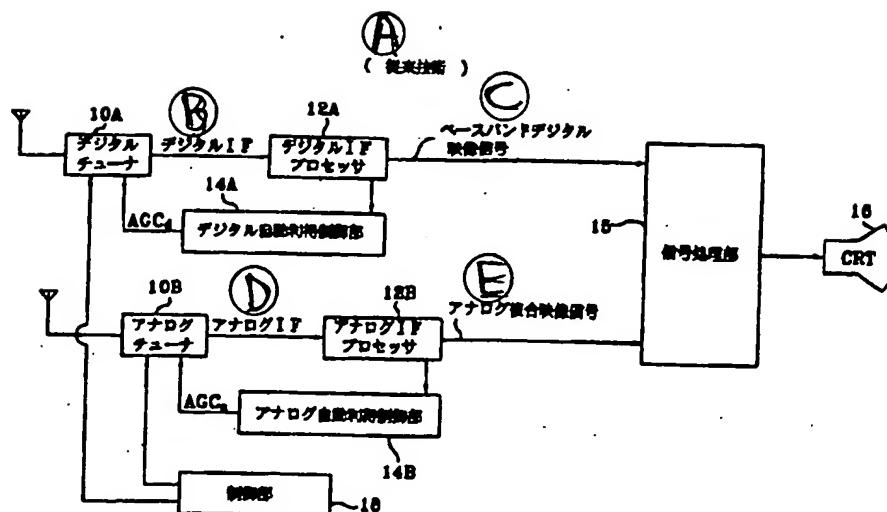


Figure 1

- Key:
- A (Prior art)
  - B Digital IF
  - C Baseband digital image signal
  - D Analog IF
  - E Analog complex image signal
  - 10A Digital tuner
  - 10B Analog tuner
  - 12A Digital IF processor
  - 12B Analog IF processor
  - 14A Digital automatic gain control unit
  - 14B Analog automatic gain control unit
  - 15 Signal processing unit
  - 18 Control unit

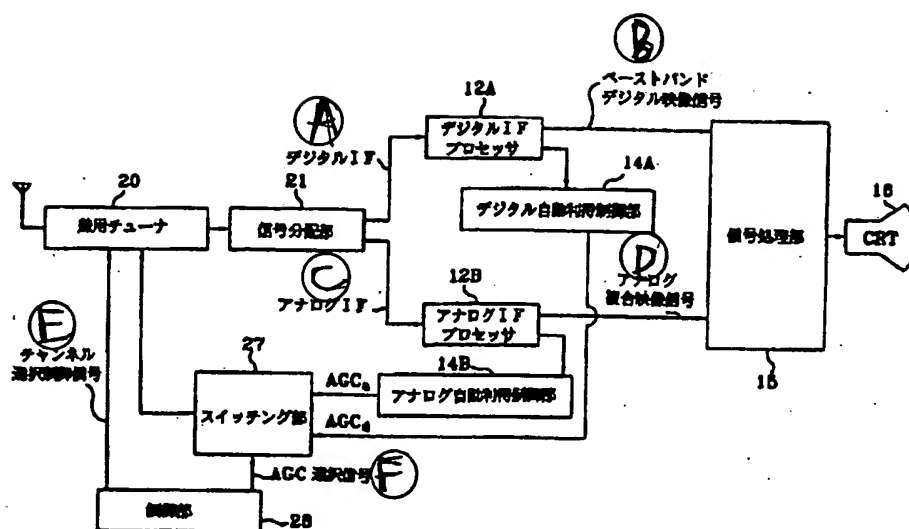


Figure 2

- Key:
- A Digital IF
  - B Baseband digital image signal
  - C Analog IF
  - D Analog complex image signal
  - E Channel selection control signal
  - F AGC selection signal
  - 12A Digital IF processor
  - 12B Analog IF processor
  - 14A Digital automatic gain control unit
  - 14B Analog automatic gain control unit
  - 15 Signal processing unit
  - 20 Analog and digital tuner
  - 21 Signal distributing unit
  - 27 Switching unit
  - 28 Control unit